MODEL QUESTION PAPER

MATHEMATICS PAPER I (A)

(Algebra, VecrorAlgebra and Trigonometry)
(English Version)

Time: 3 Hrs. Max. Marks. 75

Note : Question paper consists of 'Three' Sections A, B and C.

SECTION - A

I. Very short answer questions 10 x 2 = 20 Marks
(Attempt all questions)
(each question carries 'Two' marks)

01. Find the domain of the real valued functions $f(x) = \sqrt{9-x^2}$

02 In ΔABC, D is the mid point of BC. Express $\overline{AB} + \overline{AC}$ in terms of $\overline{AD}$

03. Find the vector equation of the line through the points $2\vec{i} + \vec{j} + 3\vec{k}$ and $-4\vec{i} + 3\vec{j} - \vec{k}$

04. If $\vec{a} = \vec{i} + 2\vec{j} + 3\vec{k}$ and $\vec{b} = 3\vec{i} - \vec{j} + 2\vec{k}$, then find the angle between $(2\vec{a} + \vec{b})$ and $(\vec{a} + 2\vec{b})$

05. Sketch the graph of sin x in $(0, 2\pi)$

06. Find the value of $\cos^2 45° - \sin^2 15°$

07. Show that $\cos h (3x) = 4 \cos h^3 X - 3 \cos hx$.

08. If $c^2=a^2+b^2$, write the value of 4 s(s-a) (s-b) (s-c) in terms of a and b.

09. Simplify $\dfrac{(\cos q - i \sin q)^7}{(\sin 2\theta - i\cos 2\theta)^4}$

10. Expand $\cos 4\theta$ in powers of $\cos\theta$

SECTION - B

II. Short answer questions. Attempt five questions 5 x 4 = 20 marks

11. $f : A \rightarrow B, g : B \rightarrow C$;
$f = \{(l, a), (2, c), (4, d), (3, d)\}$
and $g^{-1} = \{(2,a), (4, b), (1, c), (3, d)\}$
then compute $(gof)^{-1}$ and $f^{-1} og^{-1}$.

12. Find the cube root of $37-30\sqrt{3}$.

13. If $x = 1 + \log_a bc$, $y = 1 + \log_b ca$ and $z = 1 + \log_c ab$, then show that xyz = xy+yz+zx.

14. By vector method, prove that the diagonals of a parallelogram bisect each other.

15. Find the area:of the triangle formed with the points A(1, 2, 3), B (2, 3, 1) and C (3, 1, 2) by vector method.

16. Find the solution set of the equation $1 + \sin 2\theta = 3 \sin\theta \cos\theta$

17. Show that $\sin^{-1}\left(\frac{3}{5}\right) + \sin^{-1}\left(\frac{8}{17}\right) = \sin^{-1}\left(\frac{77}{85}\right)$

SECTION - C

III. Long answer questions : (Attempt '<u>FIVE</u>' questions) 5 x 7 = 35 marks

18. If $f : A \rightarrow B$ and $g : B \rightarrow C$ are bijections,
then prove that $gof : A \rightarrow C$ is also bijection.

19. Using the principle of Mathematical induction show that
$1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + ...$ upto n terms
$= \dfrac{n (n+1)^2 (n+2)}{12}$

20. For any vector $\vec{a}$, $\vec{b}$; and $\vec{c}$,

prove that $(\vec{a} \times \vec{b}) \times \vec{c} = (\vec{a} . \vec{c})\, \vec{b} - (\vec{b} . \vec{c})\, \vec{a}$

21. If A + B + C = 180°, then show that

sin 2A - sin 2B + sin2C = 4 cos A sin B cos C

22. In Δ ABC, show that

$$\frac{r_1}{bc} + \frac{r_2}{ca} + \frac{r_3}{ab} = \frac{1}{r} - \frac{1}{2R}$$

23. One end of the ladder is incontact 'with a wall and another end is in contact with the level ground making an angle 'α'. When the foot of the ladder is moved to a distance 'a' cms, the end in contact with the wall slides through 'b' cms. and the angle made by the ladder with the level ground is now 'β', show that

$$a = b \tan \left(\frac{\alpha + \beta}{2} \right)$$

24. Reduce the complex numbers 3 + 4 i,

$\frac{3}{4}$ (7+i) (1+i), $\frac{2(i-18)}{(1+i)^2}$, $\frac{5\,(i-3)}{1+i}$ to x+iy form. Show that the four

points represented by these complex numbers form a square in the argand plane.

MODEL QUESTION PAPER

MATHEMATICS PAPER - I (B)

(Calculus and Co-ordinate Gemetry)

English Version

Time: 3 Hours | Max. Marks. 75

Note: Question paper consists of three sections A, B and C.

Section - A

(Very short answer type questions)

Attempt all questions : 10x2=20 marks

Each question carries two marks. ,

01. Write the condition that the equation ax+by+c=0 represents a non-vertical straight line. Also write its slope.

02. Transform the equation 4x-3y+ 12=0 into slope-intercept form and intercept form of a straight line.

03. Find the ratio in which the point C (6,-17,-4) divides the line segment joining the points A(2,3,4) and B(3,-2,2)

04. Evaluate $\underset{x \to 0}{\text{Lt}} \quad \frac{3x-1}{\sqrt{l + x}} - 1)$

05. Evaluate $\underset{x \to \infty}{\text{Lt}} \left(\sqrt{x+1} - \sqrt{x} \right)$

06. Find the constant 'a' so that the function f given by

f(x) = sin x if x $\leqslant$ O

= x^2 + a if 0 < n < 1 is continous at x= O

07. Find the derivative of $\log_{10}x$ w.r.t x

08. IfZ = e^{ax} sinby then find Z_{ny}.

09. If y = x^2 + 3x + 6, x = 10, Δx = 0.01, then find Δy and dy.

10. Find the interval in which f (x) = x^3 - $3x^2$ is decreasing.

Section - B
(Short answer type questions)

Attempt any five questions. Each question carries Four marks

5x4=20 marks

11. Find the equation of locus of a point, the sum of whose distances from (0, 2) and (0, -2) is 6 units

12. Show that the axes are to be rotated through an angle of $\frac{1}{2}\ \text{Tan}^{-1}\left(\frac{2h}{a-b}\right)$ so as to remove the *xy* term from the equation $ax^r + 2hxy + by^r = 0$ If a $\neq$ b and through the angle $\frac{\pi}{4}$, if a = b

13. Show that the origin is within the triangle whose angular points are (2,1), (3, -2) and (-4, 1)

14. Show that the line joining the points A (+6, -7, 0) and BC (16, -19, -4) intersects the line joining the points P(0,3,-6) and Q (2,-5, 10) at the point (1,-1,2)

15. Find the derivative of tan 2x from the first principles

16. A point P is moving with uniform velocity 'V' along a straight line AB. θ is a point on the perpendicular to AB at A and at a distance '*l*' from it. Show that the angular velocity of P about θ is

17. State and prove the Eulers theorem on homogeneous functions.

SECTION - C

5 x 7 = 35 marks

18. Find the orthocentre of the triangle whose vertices are (5,-2), (-1,2) and (1,4)

19. Show that the area of the triangle formed by the lines $ax^2 + 2\gamma xy + by^2 = 0$ and $lx+my+n = 0$ is $\frac{n^2\sqrt{h^2 - ab}}{am^2 - 2\gamma ln + bl^2}$

20. Find the angle between the lines joining the origin to the points of intersection of the curve

$x^2 + 2xy + y^2 + 2x + 2y - 5 = 0$ and the line $3x - y + 1 = 0$

21. If a ray makes angle α, β, γ, and δ with the four diagonals of a cube, show that

$\cos^2\alpha + \cos^2\beta\ \cos^2\gamma + \cos^2\delta = \frac{4}{3}$

22. If $x^{\log y} = \log x$ then prove that $\frac{dy}{dx} = \frac{y}{x}\ \frac{(1 - \log x \log y)}{(\log x)^2}$

23. Show that the semi-vertical angle of the right circular cone of a maximum volume and of given slant height is $\text{Tan}^{-1}\sqrt{2}$

24. If the tangent at any point on the curve $x^{2/3} + y^{2/3} = a^{2/3}$

intersects the co-ordinate axis in A,B, then show that the length AB is constant.